MCDONNELL DOUGLAS

McDonnell Douglas Realty Company

August 18, 1997

Mr. Thomas J. Quinn
LOCKHEED MARTIN
LMC Properties, Inc.
P.O. Box 5061
Baltimore, Maryland 21220

Mr. Stephen G. Hoy
FREMONT ASSOCIATES
970 W. 190th Street, Suite 220
Torrance, CA 90502

Re: Proposed Vesting Tract Map/ EIR Approval

Gentlemen:

This will confirm our agreement not to appeal the Lockheed Martin/Fremont Vesting Tract Map/EIR, subject to the following conditions:

1. Termination of the rail easement rights across our property must be executed today and recorded prior to the Lockheed Martin/Fremont closing.

2. A Reciprocal Easement Agreement ("REA") substantially in conformance with the August 15, 1997 Draft by D'Ancona and Pflaum, but showing Sunshine and Boeing Realty Corporation ("BRC") as successors to Fremont and MDRC as well as the following changes:

   A. Fremont/Sunshine will agree to maintain the Fire Lane (including the fenced landscape area) so long as the adjacent Buyer of BRC land does not install a Fire Department-approved, crash-gate for access into the Fire Lane (at which time the new adjacent property owner will agree to a proportionate share of maintenance costs by Fremont/Sunshine).

   B. Utility and rail easements (items 6 and 7) will be deleted from the REA since they are included in Latham & Watkins' "Easement Deed and Agreement".

   C. Interest rate will be reduced from 18% to Wells Fargo Prime or maximum legal rate.

We propose that the REA will be executed not later than September 15, 1997.

3. The Easement Deed and Agreement will be executed not later than September 15, 1997.

4. Environmental: Execution of an Agreement substantially similar to the attached August 18, 1997 Draft prepared by our collective legal staffs, will be executed not later than September 15, 1997.

5. Completion of Traffic Mitigation Cost Sharing Agreement with the understanding that we will agree to design, bond for, and construct (in accordance with LADOT requirements to allow Fremont's permitting to proceed without delay) the required improvements at 190th Street/I-405 south bound off ramp and the 190th Street and Normandie Avenue intersection. You will agree to be similarly responsible for Western/Artesia; Western/I-405 north bound on ramps; 190th I-405 south bound on-off ramps and; Western/Del Amo. Each parties cost will be further defined and agreed upon by September 15, 1997 with one party reimbursing the other to equalize the costs based upon a proportional share equal to average A.M. and P.M. peak hour total traffic volumes through each intersection.

We sincerely appreciate your expeditious responses last week and we look forward to attaining closure of all the above issues by September 1997. Assuming that this accurately documents our agreement, we would appreciate your faxing back a copy of your signatures to allow everyone to proceed with the detailed items noted above.

Thank you.

Sincerely,

Thomas J. Motherway

cc: Tom Wolff
Brad Rosenheim

Approved By:		Approved By:	
Thomas J. Quinn	Date	Stephen G. Hoy	Date
LMC Properties, Inc.		Fremont Associates	

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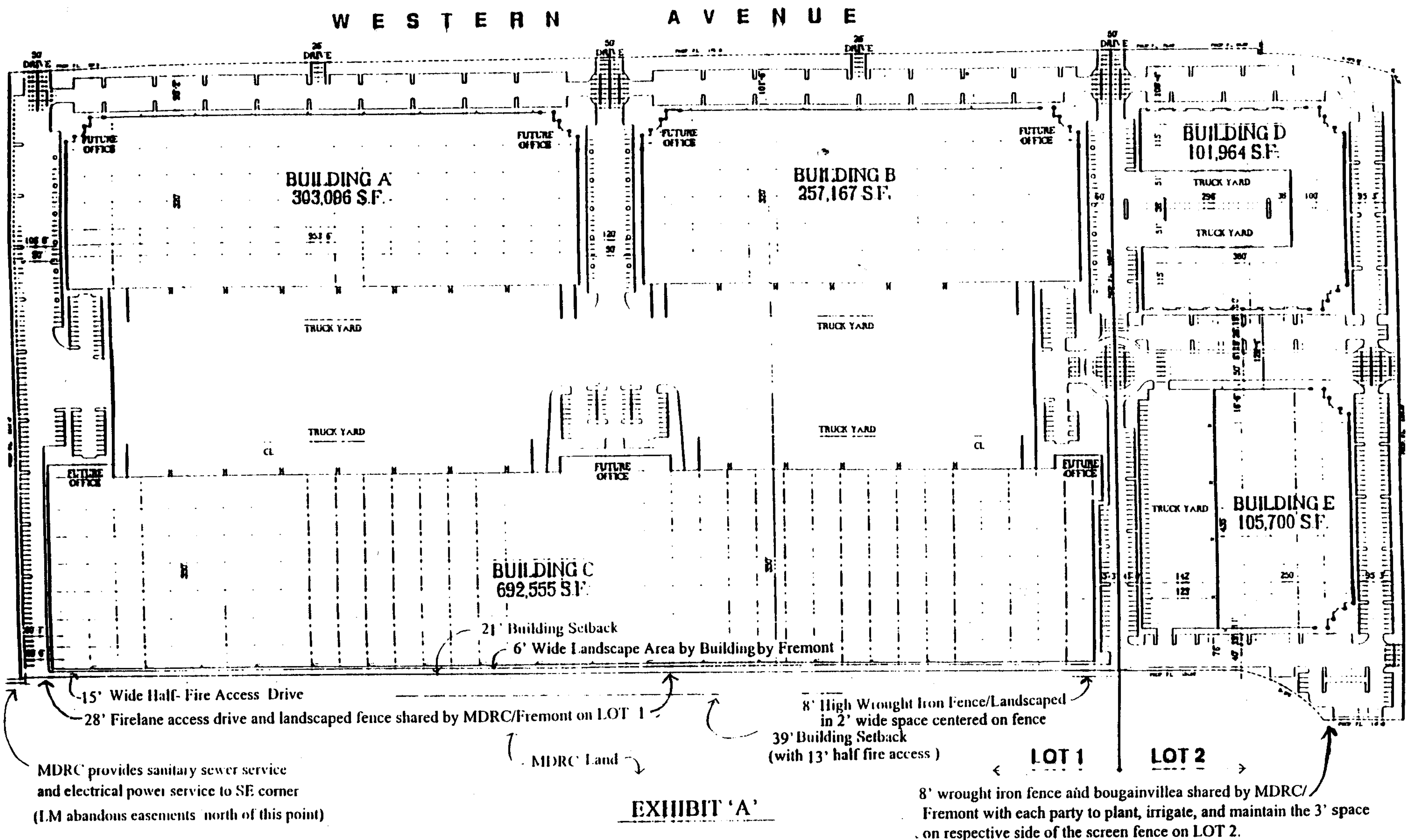
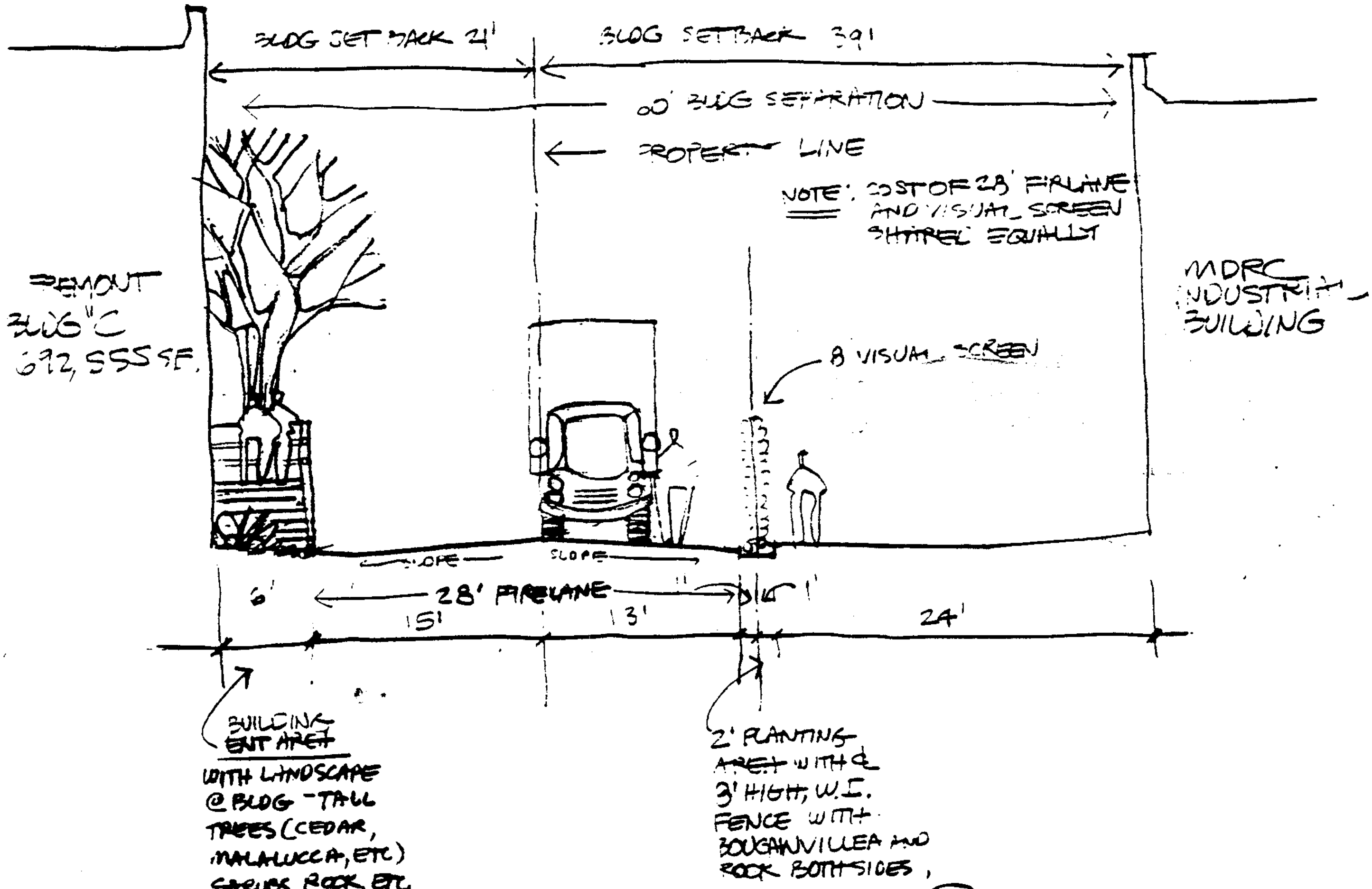


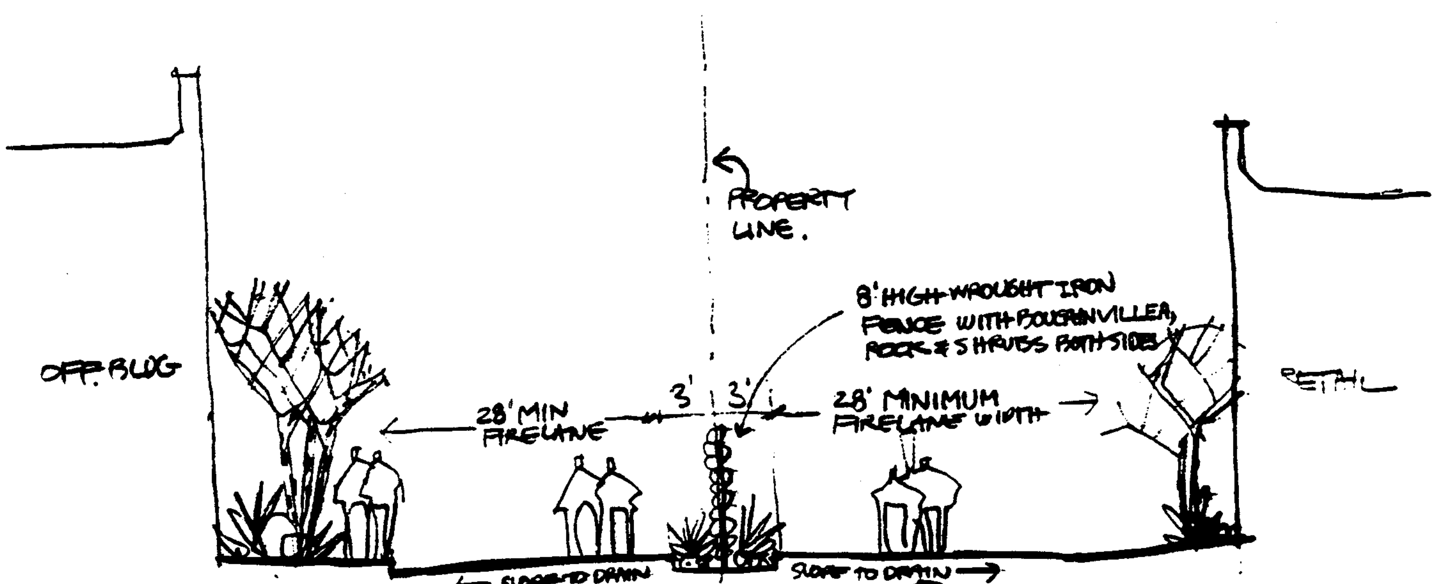
EXHIBIT 'A'

SITE PLAN NOTES

EXHIBIT 'B'
TYPICAL SITE SECTIONS



TYPICAL SITE SECTION (1)



TYPICAL SITE SECTION (2)
(@ RETAIL / OFFICE BLDG.)

BOE-C6-0115672

AGREEMENT

This Agreement is being made and entered into as of August __, 1997 by and between Boeing Realty Corporation ("BRC") and Lockheed Martin Corporation ("LMC").

Recitals

A. BRC and LMC are the owners of adjacent parcels of real property shown on the map attached hereto as Exhibit A, which identifies their respective interests. The adjacent parcels are hereinafter referred to respectively as the "BRC Parcel" and the "LMC Parcel."

B. Based on existing ground water analytical data, certain "constituents of concern" ("COC's"), more particularly described in Exhibit B, have migrated from the LMC Parcel to the BRC Parcel.

C. LMC has acknowledged its responsibility for the COC's, and the parties have entered into this Agreement for the purpose of documenting their mutual understanding in respect of (i) necessary monitoring and remediation of the COC's, and (ii) LMC's indemnification of BRC for losses arising in connection with the COC's.

Agreement

1. LMC agrees to reimburse BRC upon demand for out-of-pocket costs and expenses incurred by BRC in connection with mapping and monitoring the migration of the COC's from the LMC Parcel, which shall be conducted in accordance with the plan attached hereto as Exhibit C. Costs and expenses to be reimbursed hereunder shall include, but not be limited to, those arising from development of a work plan and installation of temporary and long term ground water monitoring wells, sampling and sounding of the wells, development of monitoring reports, closing of temporary wells, and laboratory costs and fees. LMC shall tender payments, as directed by BRC, not later than 30 days following receipt of BRC's request for reimbursement and supporting invoices. LMC's liability under this Section 1 shall be limited to $150,000.

2. LMC agrees to perform at its own expense, or, if agreed by the parties, reimburse BRC for the expense of performing, such remediation of the COC's as may be required by any governmental authority having jurisdiction. BRC agrees: (i) to provide LMC and its representatives access to the BRC Parcel upon reasonable notice; (ii) to permit, with a minimum of disruption to BRC and/or any tenant of BRC and upon reasonable prior written notice, limited environmental audits at LMC's sole expense, to assess whether subsequent activities on the BRC Parcel may impact ground water quality; (iii) to permit LMC to construct and install remediation systems on the BRC Parcel as

may be required by any governmental authority or as may reasonably be deemed necessary and desirable in the sole discretion of LMC but with due regard given, with the objective of consistency in treatment, to the course of actions taken in respect to the COC's on the LMC Parcel, provided that any remediation or monitoring system so installed by or under the direction of LMC, and any remediation or other activities conducted on the BRC Parcel by or under the direction of LMC shall be designed or carried out in such a manner that the same will not create an unsightly appearance or unreasonably interfere with the use of the BRC Parcel by BRC, any subsequent owner, or their respective tenants; (iv) to promptly notify LMC of any act, event or condition of which BRC has actual knowledge, which BRC believes could give rise to a remediation claim and cooperate fully with LMC's technical representatives to address such act, event or condition, including the giving of appropriate and reasonable authority to LMC, if needed in LMC's opinion, to act on BRC's behalf, but at LMC's sole cost.

3. LMC agrees to indemnify, protect, hold harmless and defend: (i) BRC, its directors, officers, employees and agents, and (ii) any assignee or transferee of all or part of BRC's interest in the BRC Parcel, any other direct or indirect successors to all or part of BRC's interest in the BRC Parcel, including, but not limited to, any lessee, sublessee or lender, and their respective directors, officers, employees and agents (the "BRC Successors"), from and against any and all liability proximately caused by the presence of the COC's on, under or about, or the migration of the COC's to, the BRC Parcel, including, but not limited to: (a) all foreseeable and unforeseeable consequential damages (but subject to the limitation hereafter set forth in this Section 3), and (b) any suit, claim, demand, action, liability, judgment, cost, fee, or other requirement arising out of any third party claim for personal injury, property damage, natural resources damage or environmental cleanup or mitigation expenses. The foregoing indemnity specifically includes, but is not limited to, actual physical damage or injury sustained by BRC or its employees, tenants or invitees caused as a proximate result of LMC's or its contractors' negligent acts or omissions on the BRC Parcel in connection with the performance of remediation activities. LMC shall be responsible to indemnify BRC against consequential damages under subpart (a) hereof only in the event that LMC elects not to perform remediation reasonably requested by BRC's environmental consultant which might have materially mitigated such damages. The foregoing limitation shall not be applicable to consequential damages, whether foreseeable or unforeseeable, included in any judgment against BRC or another indemnitee arising out of any third party claim in respect of which LMC is required to provide indemnification hereunder.

4. The rights of BRC under this Agreement may be enforced by any one or more of the BRC Successors, provided any such party seeking to exercise such rights shall have executed and delivered to LMC its acknowledgement of and consent to be bound by the terms of this Agreement and shall not have refused the access and environmental audit rights granted to LMC hereunder. The BRC Successors shall in no event have any greater indemnity rights than BRC hereunder nor, subject to applicable court rules and rules of procedure, shall a multiplicity of litigation be permitted as a result of the extension of the rights of BRC under this Agreement to the BRC Successors, it

being understood that claims or litigation by multiple parties for enforcement of an indemnity claim shall be consolidated. Any defenses which LMC could have asserted against BRC may be asserted against the BRC Successors.

5. LMC hereby acknowledges and agrees that LMC's duties, obligations and liabilities under this Agreement are in no way limited or otherwise affected by any information BRC may have (or studies it has done) concerning the BRC Parcel and/or the presence in, at, on or under the BRC Parcel of any Contamination.

6. All payment obligations of LMC to BRC hereunder shall be payable immediately upon demand and shall bear interest following demand at a rate that is the lesser of ten percent per annum or the highest rate permitted under law. LMC shall tender payments, as directed by BRC, not later than 30 days following receipt of BRC's request for payment and supporting invoices (if applicable). If, upon final judicial determination of the payment dispute by a court of competent jurisdiction, it is determined that the payment made by LMC was not owing under this Agreement, BRC shall promptly reimburse LMC for the payment made by LMC with interest thereon accruing from the date the payment was delivered to BRC at a rate that is the lesser of ten percent per annum or the highest rate permitted under law.

7. [Intentionally Deleted]

8. All notices, demands and other communications required or permitted to be given or served under this Agreement shall be in writing and shall be delivered to the apporpriate party at its address as follows:

If to BRC: Boeing Realty Corporation
4060 Lakewood Blvd. 6th Floor
Long Beach, CA 90808-1700
Attention: S. M. Stavale

If to LMC: Lockheed Martin Corporation
c/o LMC Properties, Inc.
Mail: P.O. Box 179,
Denver, CO 80201
Messenger: 12999 Deer Creek Canyon Road
Littleton, CO 80127
Attention: John C. Peterson

Addresses for notice may be changed from time to time by written notice to all other parties. All communications shall be effective when actually received; provided, however, that nonreceipt of any communication as the result of a change of address of which the sending party was not notified or as a result of a refusal to accept delivery shall be deemed receipt of such communication.

9. This Agreement shall be governed by and construed in accordance with the laws of the State of California.

10. This Agreement may be signed in counterparts, each of which shall constitute an original, but all of which together shall constitute one and the same instrument.

11. Each party participated in the preparation of this Agreement personally and with the benefit of counsel. If this Agreement is ever construed by a court of law or equity, such court shall not construe this Agreement, or any provision hereof, more harshly against any party as drafter.

12. This Agreement constitutes the entire agreement between the parties respecting the specific matters addressed herein and supersedes all other prior or concurrent oral or written letters, agreements or understandings, without limitation.

13. (a) In the event of any action or proceeding instituted between LMC and BRC or any third party entitled to indemnification hereunder, then the prevailing party shall be entitled to recover from the losing party its attorneys' fees, and all fees, costs, and expenses incurred in connection with such action or proceeding. In addition to the aforementioned fees, costs, and expenses, the prevailing party in any action or proceeding shall be entitled to its attorneys' fees, and all fees, costs and expenses incurred in any appeal and any postjudgment proceedings to collect or enforce any judgment. This provision for the recovery of postjudgment fees, costs, and expenses is separate and several and shall survive the merger of this Agreement into any judgment on this Agreement..

(b) LMC and BRC have agreed on the following mechanisms in order to obtain prompt and expeditious resolution of all controversies, claims or disputes arising out of or in connection with the performance or non-performance of any terms of this Agreement. By accepting any benefit of this Agreement, each third party entitled to indemnification hereunder also accepts and agrees to be bound by the provisions of this Section 13.

(i) Any dispute seeking damages, interpretation of this Agreement and any dispute seeking equitable relief, such as but not limited to specific enforcement of any provision hereof, shall be heard and determined by a referee pursuant to California Code of Civil Procedure Section 638, subdivision 1. The venue of any proceeding hereunder shall be in Los Angeles County or Orange County, unless changed by order of the referee.

(A) The party seeking to resolve the dispute shall file in court and serve on the other party a complaint describing the matters in dispute. Service of the complaint shall be as prescribed by California law. At any time after service of the complaint, any party may request the designation of a referee to try the dispute. Thereafter LMC and BRC or other indemnified party shall use their best efforts to agree upon the selection of a referee from among the available referees at Judicial Arbitration and Mediation Service ("JAMS"). If LMC and BRC or other indemnified party are unable to agree upon a referee within ten days after a written request to do so by any party, then either may petition the judge of the Superior Court to whom the case is then assigned to appoint a referee from JAMS. For the guidance of the judge making the appointment of said referee, the parties agree that the person so appointed shall be a retired judge from JAMS experienced in the subject matter of the dispute.

(B) To the extent consistent with the terms of this Agreement, the provisions of California Code of Civil Procedure, Sections 642, 643, 644 and 645 shall be applicable to dispute resolution by a referee hereunder. In an effort to clarify and amplify the provisions of California Code of Civil Procedure, Sections 644 and 645, the parties agree that the referee shall decide issues of fact and law submitted by the parties for decision in the same manner as required for a trial by court as set forth in California Code of Civil Procedure, Sections 631.8 and 632, and California Rules of Court, Rule 232. The referee shall try and shall decide the dispute according to all of the substantive and procedural law of the State of California, unless LMC and BRC or other indemnified party involved in the dispute stipulate to the contrary. When the referee has decided the dispute, the referee shall also cause the preparation of a judgment based on said decision. The judgment, to be entered by the Superior Court of Los Angeles County or Orange County, California, will be based upon the decision of the referee. The referee's decision shall be appealable in the same manner as if the judge signing the judgment had tried the case.

(ii) All parties to the dispute shall diligently cooperate with one another and the person appointed to resolve the dispute, and shall perform such acts as may be necessary to obtain a prompt and expeditious resolution of the dispute. If any party refuses to diligently cooperate, and any other party, after first giving notice of its intent to rely on the provisions of this paragraph, incurs additional expenses or attorneys' fees solely as a result of such failure to diligently cooperate, the referee may award such additional expenses and attorneys' fees to the party giving such notice, even if such party is not the prevailing party in the dispute.

(iii) The cost of the proceeding shall initially be borne equally by the parties to the dispute, but, subject to Section 13(b)(ii) hereof, the prevailing party(ies) in such proceeding shall be entitled to recover, in addition to reasonable attorneys' fees and all other costs, its contribution for the reasonable cost of the referee as an item of recoverable costs. The referee shall include such costs in his judgment or award.

14. LMC, concurrently with the execution and delivery of this Agreement (provided BRC has given LMC at least 20 days' prior written notice) and thereafter upon 20 days' notice from BRC or another indemnified party, shall provide such party with an

estoppel certificate confirming (i) the effectiveness of this Agreement and (ii) the recognition of a prospective purchaser, lessee, lender or other party as an indemnified party.

15. LMC's obligation to indemnify BRC and the BRC Successors against consequential damages under Section 3 hereof shall expire December 31, 2015, at which time no further extensions shall accrue as a matter of right, and the contractual rights of, and obligations to, BRC and the BRC Successors under this Agreement in respect of consequential damages only shall terminate except for the enforceability of unfulfilled obligations of LMC under any indemnity obligations arising prior to the termination date. The termination of this contractual undertaking shall not in itself relieve LMC of any liability for consequential damages it otherwise has independently under the law.

SHH102B.DOC

This Agreement has been made and entered into as of the date first above written.

BOEING REALTY CORPORATION

By: ______________________________

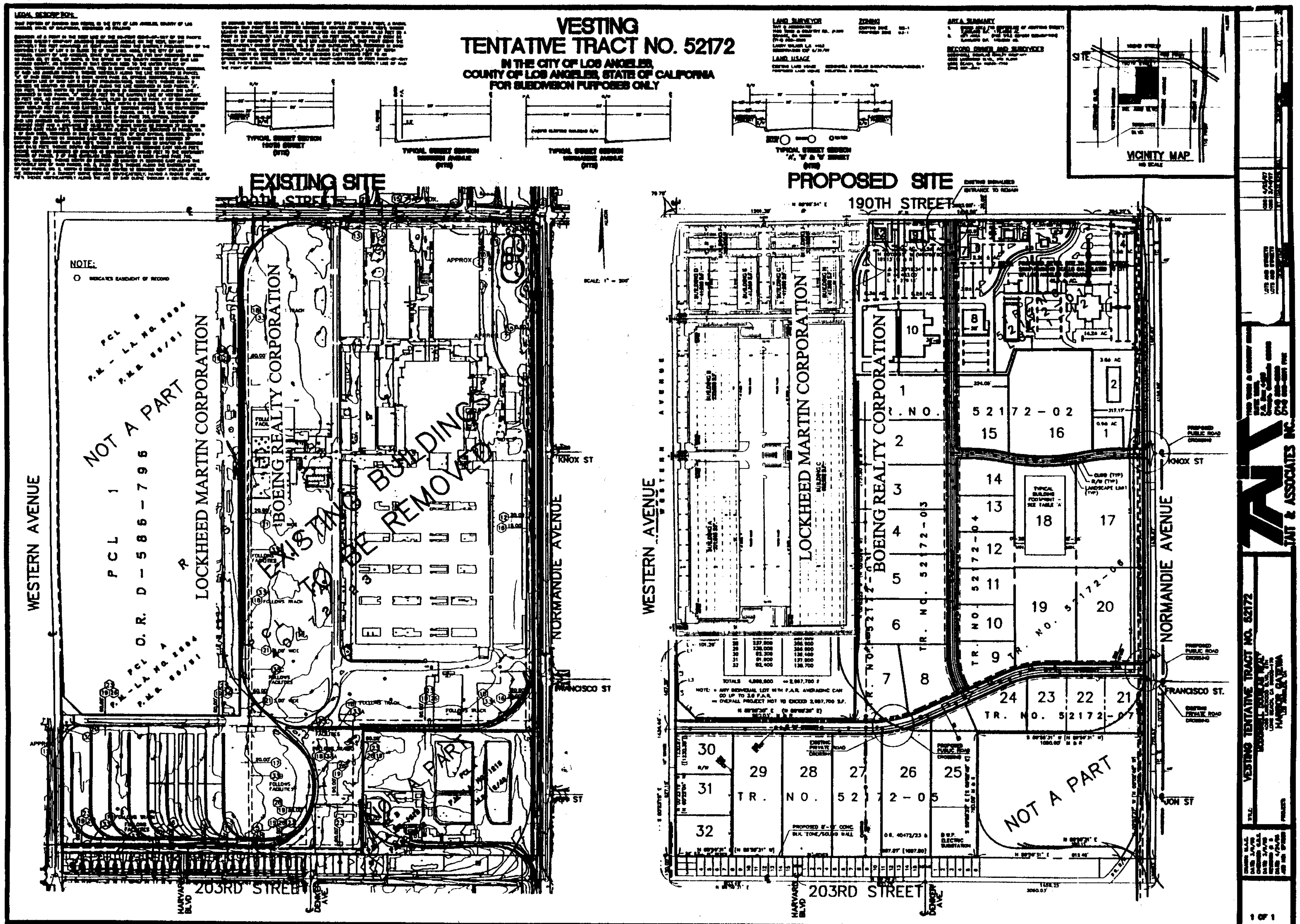
Title: ______________________________

LOCKHEED MARTIN CORPORATION

By: LMC PROPERTIES, INC.
Attorney-in-fact under Irrevocable Power of Attorney
dated June 5, 1996

By: ______________________________

Title: ______________________________



VESTING
TENTATIVE TRACT NO. 52172
IN THE CITY OF LOS ANGELES,
COUNTY OF LOS ANGELES, STATE OF CALIFORNIA
FOR SUBDIVISION PURPOSES ONLY
VICINITY MAP
SITE
EXISTING SITE
PROPOSED SITE
190TH STREET
203RD STREET
WESTERN AVENUE
NORMANDIE AVENUE
KNOX ST
FRANCISCO ST.
JON ST
HARVARD BLVD
DENKER AVE
NOTE:
LOCKHEED MARTIN CORPORATION
BOEING REALTY CORPORATION
NOT A PART
PCL 1
O. R. D-585-796
EXISTING BUILDING TO BE REMOVED
TR. NO. 52172-02
TR. NO. 52172-03
TR. NO. 52172-04
TR. NO. 52172-05
TR. NO. 52172-06
TR. NO. 52172-07
TAIT & ASSOCIATES INC.
VESTING TENTATIVE TRACT NO. 52172
1 OF 1

EXHIBIT A

EXHIBIT B

The COC's include the following chemicals found in ground water, disclosed by testing completed as of the date of this Agreement:

1,1-DCE 1,1,-DCA 1,1,1-TCA TCE MIBK cis-1,2-DCE	trans-1,2-DCE Chloroform Benzene Toluene	Methylene Chloride PCE	1,1,2-TCA

In addition, the COC's include any other substances which hereafter may be found to have migrated to the BRC Parcel from the LMC Parcel, if such substances have been determined, or are alleged, to cause or threaten injury or damage to human health, property or the environment. Substances which meet this standard include, without limitation, those defined as "hazardous substance," "hazardous materials" or "toxic substances" in the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (Title 42 USC §§9601-9675), the Hazardous Materials Transportation Act, as amended (Title 42 USC §§1801-1819), or the Resource Conservation and Recovery Act of 1976, as amended (Title 42 USC §§6901-6992k), and any substance defined as "hazardous waste" in California Health and Safety Code §25117 or as "hazardous substance" in California Health and Safety Code §25316 (with all references to the foregoing laws deemed to include the regulations adopted and publications promulgated under these laws).

Exhibit C

Phase I Groundwater Characterization Workplan

Boeing Realty Company
C-6 Facility, Parcel A

Los Angeles
California

August 1997

Prepared by
Integrated Environmental Services, Inc.

For
The Boeing Company

1. INTRODUCTION

The Boeing Realty Company (Boeing), a wholly owned subsidiary of The Boeing Company, is currently involved in redeveloping Parcel A of the C-6 Facility (Site) in Los Angeles, California. As part of the redevelopment effort, a review of historic and recent Site environmental data was conducted. The results of that review indicate that groundwater contaminants originating from the neighboring Lockheed Martin Corporation (LMC), International Light Metals (ILM) facility have migrated off-site and are now contaminating groundwater beneath the Boeing property. The Boeing property shares a common boundary with the LMC property and is hydraulically down gradient.

An investigation of groundwater beneath the western portion of the C-6 facility has been proposed jointly by Boeing and LMC and has been funded by LMC to characterize and delineate the groundwater contaminant plume migrating from the LMC property. The agreement also calls for LMC to remediate groundwater beneath the western portion of the Boeing property that has been impacted by contaminants migrating from the LMC property. Data obtained during the groundwater investigation will be needed to develop and evaluate appropriate remedial alternatives.

This workplan has been developed to provide procedures for installing monitoring wells and for collecting and analyzing the first round of groundwater samples collected from the wells during the investigation. Subsequent sampling and investigative tasks will be covered by workplans developed specifically for those tasks.

1.1 MDRC C-6 FACILITY HISTORY

The Boeing property is located at 19503 South Normandie Avenue in Los Angeles, California, just south of the San Diego Freeway (I-405) and approximately one mile west of the Harbor (I-110) - San Diego Freeway interchange (**Exhibit 1**).

Aerial photographs indicate that the area was farmland prior to the 1940s. Industrial use of the property began in 1941 when the Defense Plant Corporation (Plancor) developed the site as part of an aluminum reduction plant. The Aluminum Company of America (ALCOA) operated the plant for the government to produce aluminum during World War II. Five "pot lines" were originally constructed at the plant, but only three were placed in operation. ALCOA operated the

BOE-C6-0115683

plant until it was closed in September 1944. The War Assets Administration then used the site for temporary storage during the following two years. In 1948, Columbia Steel Company purchased the property. No significant changes were made to the plant under Columbia Steel Company ownership (CDM 1991).

In March 1952, the US Navy purchased the property and established the Douglas Aircraft Company (DAC) as the contractor and operator of the facility for the manufacture of aircraft and aircraft parts. DAC purchased the property from the Navy in 1970 and used the facility to manufacture components for various commercial and military aircraft until approximately 1992. DAC has used the C-6 facility for the storage and distribution of aircraft parts since cessation of manufacturing activities (K/J 1996a, b, c).

Boeing began a phased redevelopment of the 170-acre property in 1996[1] (phased both in terms of actual environmental activities and demolition). As shown in **Exhibit** 2, the property has been divided into three parcels (A, B, and C). Each parcel will undergo, as required, environmental investigation, assessment, and remediation prior to construction. Redevelopment of the northernmost portion of the property, Parcel A, began in 1996 and is ongoing. Historically, the westernmost portion of Parcel A has always been an employee parking lot – no operations have occurred in the area of Parcel A bordering the LMC property.

1.2 International Light Metals Facility History

The LMC property, located at located at 19200 South Western Avenue, is adjacent to and west of the Boeing property **(Exhibit 1)**. Industrial development of the LMC property began in 1942 when Plancor constructed an aluminum extrusion facility on the property. The plant, known as Plancor 326, was operated by Bohn Aluminum & Brass Corporation on behalf of the United States Government. Extrusion operations at the site began in late 1943 or early 1944 (HMC 1993).

The facility was shut down on August 15, 1945 following the end of World War II, and the property was transferred to the Reconstruction Finance Corporation and the War Assets Administration for disposition. A Reconstruction Finance Corporation drawing from 1946 **(Exhibit 3)** shows the Defense Plant Corporation properties in Los Angeles. The properties

[1] McDonnell Douglas Realty Company (MDRC), began the redevelopment. MDRC became a wholly owned subsidiary of The Boeing Company on August 1, 1997, and is now known as Boeing Realty Company.

include the Bohn (LMC) and the ALCOA properties (Boeing). The western portion of what is now Parcel A of the Boeing property is labeled "Office Parking" on the drawing (HMC 1993).

The Reconstruction Finance Corporation leased the property to The Harvey Machine Company in October 1946. The Harvey Company moved munitions equipment from its Long Beach facility to the site in order to expand the extrusion capabilities of the plant to include brass and copper. The Harvey Company purchased the property in December 1948, and between 1950 and 1953 began to rapidly expand and improve operations at the newly created Harvey Aluminum facility. In 1956, Harvey Aluminum began a second major expansion of the facility and continued to increase production capabilities until the mid-1960s when expansion of the facility ceased. The later expansions gave Harvey Aluminum the ability to extrude brass, steel, titanium, and zirconium, and ultimately, the company emerged as the leading producer of titanium and related products in the United States (HMC 1993).

Martin Marietta Corporation began acquiring interest in The Harvey Company, and in April 1972 changed the name of the facility to Martin Marietta Aluminum, Inc. During the period between 1972 and 1975, Martin Marietta Aluminum began to curtail some operations at the plant and focused on the core aluminum and titanium output (HMC 1993). The facility produced titanium and aluminum extrusions and forgings for the aerospace and automotive industries. Operations at the facility were divided into two divisions: Aluminum Division and Titanium Division. Operations occurring at the Aluminum division included:

- Casthouse Operations, where pure and pedigree scrap aluminum were alloyed and prepared for the Division's forge and extrusion operations. Wastes generated during casthouse operations included spent lubricating oil, clay used in absorbing oil spills, rags and filters from the maintenance of hydraulic equipment, and oil-contaminated wastewater (K/J 1994)

- Forge Operations, where aluminum billets from the casthouse were placed into a furnace and forged by a hydraulic press. The forged metal was then etched and rinsed. Hexavalent chromium was occasionally used as an etchant. Wastes generated in forging operations included spent acidic and caustic solutions, tank bottom sludges containing metals, waste hydraulic oil, and steam-cleaning water contaminated with hydraulic fluid (K/J 1994).

- Extrusion Operations, where aluminum billets were heated almost to the melting point of aluminum and then sent through the extrusion press. The types of wastes generated in extrusion operations were not provided in the referenced report (K/J 1994).

The Titanium Division melted pure and scrap titanium into ingots. The ingots were then dry forged, extruded, or rolled into their final shapes. Processes within the division that generated waste include grinding, metal cleaning, parts rinsing, hydraulic systems draining, and general plant maintenance. The types of wastes produced included spent sulfuric, nitric, and hydrofluoric acids, spent sodium hydroxide, waste TCA and petroleum solvents, waste oils, acid/caustic sludges, aluminum dross, and PCBs (K/J 1994).

In 1984, Martin Marietta Corporation set up a joint venture with Nippon Ko Kan. (NKK), a Japanese steel and shipbuilding corporation with interests in aluminum, and the facility was renamed International Light Metals Corporation. NKK withdrew from the joint venture in 1991. Martin Marietta tried unsuccessfully to find a buyer for the property, and decided to close the facility in 1992. Aluminum extrusion production ended in April of that year, followed by titanium in June and aluminum forging in August (HMC 1993). Structures at the site have been razed and the top 10' of soil have been remediated.

1.3 Regional Geology and Hydrogeology

The properties are situated within the West Coast Basin, a major groundwater basin which underlies approximately 160 square miles of the coastal plain in southwestern Los Angeles County. The facilities are located in an area where surface geology is characterized by Holocene Age sediments within the Torrance plain. The Torrance plain is defined as the area between Palos Verdes Hills to the south and the distinct belt of hills caused by folding and flexures along the Newport-Inglewood Uplift to the north. The western boundary of the basin is the Pacific Ocean, while the eastern boundary constitutes San Pedro Bay and the Dominguez Gap. The sites are underlain by Holocene and Pleistocene alluvium deposits that comprise the local hydrogeologic system described below (MW 1994).

Two geologic formations exist beneath the properties: the Lakewood formation and the San Pedro Formation. The Lakewood formation extends to a depth of approximately 180 feet bgs and contains two major hydrogeologic and stratigraphic units known as the Bellflower aquiclude and the Gage aquifer (MW 1994).

In the vicinity of the properties, the Bellflower aquiclude is composed of low-permeability late Pleistocene age sediments which lie above the Gage aquifer. The unit is composed predominantly of silty clays with thin, discontinuous sand lenses or gravelly clays. The Bellflower aquiclude extends to a depth of approximately 100 feet bgs (MW 1994, K/J 1996d).

The Gage aquifer underlies the Bellflower aquiclude and extends over the entire West Coast basin and is composed of water-bearing fine medium to coarse sand with variable amounts of coarse gravels and thin beds of silt and clay in the vicinity of the subject properties. The Gage aquifer is thought to have an approximate thickness of 30 to 40 feet and is encountered at approximately 150 feet bgs (MW 1994).

The San Pedro Formation, which underlies the Lakewood Formation consists of lower Pleistocene deposits of marine origin and contains the Lynwood and Silverado aquifers. The San Pedro formation extends to a depth of approximately 1,000 ft bgs (K/J 1996d). The Lynwood formation has an approximate thickness of 90 feet and is encountered at a depth of about 310 feet beneath the properties. The Silverado aquifer is encountered at a depth of approximately 520 feet bgs. The Silverado is considered a source of drinking water (K/J 1996d), and is the primary water source for the basin due to its high specific yield through the coarser sediments and its good water quality. The Silverado is continuous and merges with the Lynwood aquifer at the base of the El Segundo Sand Hills to the west (MW 1994).

Data collected from monitoring wells installed on the Boeing property and LMC property indicate that groundwater flow in the region is generally to the southeast. The LMC data indicate that groundwater beneath the site is unconfined with a local hydraulic gradient of 0.0055 feet/foot. Groundwater beneath the LMC property generally occurs at depths ranging from 65 to 70 feet bgs and flow is generally to the east and southeast (G&M 1996a). Groundwater occurrence beneath the Boeing property also occurs at approximately 65 feet bgs with flow generally to the southeast (K/J 1996a, b, c).

2. DATA QUALITY OBJECTIVES

The overall objective of this multi-phased groundwater study program is to develop sufficient information to make informed decisions for the evaluation of groundwater contamination and remedial alternatives. These alternatives have been or will be developed to eliminate, reduce, or control any potential threat to the environment posed by the contaminants present in the groundwater and source areas. The users of the data generated as a result of this program include the Regional Water Quality Control Board and Department of Toxic Substance Control of the California Environmental Protection Agency, Boeing, and Lockheed Martin Corporation. To accomplish the objective of this program, four data quality objectives (DQOS) have been developed for the project. These DQOs are as follows:

1. Determination of the lateral and vertical extent of groundwater contamination.
2. Characterize and confirm existing contaminants, and identify and confirm the presence of additional contaminants which may be present.
3. Develop sufficient data for groundwater fate and transport modeling to predict the concentration over time of the contaminant plume present in the groundwater.
4. Develop sufficient data resources to develop and evaluate remedial action alternatives identified by Boeing and LMC.

Several of these DQOs are interrelated, and data collection efforts can serve to meet more than one objective. Specific tasks have been developed to enable this study to meet each specific objective. The following discusses each of the program objectives and identify the specific tasks needed to meet the objective. This workplan has been developed to specifically address the delineation and characterization of the groundwater contaminant plume in the Bellflower aquiclude. Based on the information obtained in this first phase of the program, additional groundwater data collection efforts may be necessary in order to satisfy all program DQOs.

2.1 DETERMINE THE LATERAL AND VERTICAL EXTENT OF CONTAMINATION

Although groundwater contamination is well documented (wells P-1 and DAC-P1) and the source of this contamination has been established, little groundwater data has been collected on the lateral and vertical extent of contamination on the Boeing property. Previous site investigations have tended to focus on the source and therefore lack an overall perspective of the extent of groundwater contamination. For this study, groundwater samples will be collected from existing wells, and additional monitoring wells will be installed into the shallow aquifer system. The intent of the additional wells is to investigate the horizontal extent of contamination, to quantify the volume of contamination, and assist with the screening of remedial alternatives. Vertical extent will be evaluated during well development and may require that wells be advanced below initial specifications.

2.2 Identify the Nature of Contaminants

The previous investigations have focused on chlorinated VOCs. The presence of these compounds will be verified through sampling of groundwater. In addition, studies conducted by LMC (G&M 1996a) have identified other potential contaminants such as non-chlorinated VOCs, diesel and hexavalent chromium. These additional compounds will be investigated on a limited basis in areas where they may reasonably be expected to exist. If present, these compounds would be expected to substantially affect the selection of the preferred remedial alternative and are therefore critical.

2.3 Determination of Contaminant Fate and Transport in the Environment

Limited data has been generated concerning the long-term fate and transport of contaminants in the underlying aquifer. Computer simulations can be used to predict the movement and transformation of contaminants within the aquifer over time. Prior to the selection a remedial technology, computer models will be used in the simulation of contaminant response to each proposed remedial alternative. To fully simulate the effectiveness of the remedial alternatives the transmissivity, storativity, and spacial characteristics of the aquifer systems must be determined. Once long-term fate and transport data is required, the data needed to evaluate the fate and transport analysis will be examined, and additional data collection may be required.

2.4 Develop Sufficient Data to Evaluate the Remedial Alternatives

Although the full list of remedial alternatives to be screened has not yet been developed, the data collected for the site must include both the quality and breadth to allow accurate development of remedial alternatives incorporating existing technologies. This workplan provides the basis for evaluation of the horizontal and vertical extent of groundwater contamination, determination of the characteristics of the aquifer systems beneath the site, and investigation of the potential fate of contaminants in the aquifer overtime and in response to remedial alternatives. As remedial alternatives are proposed and technologies investigated, the data needed to evaluate these proposals will be examined, and additional data collection may be required.

3. SAMPLING RATIONALE

Geraghty & Miller, Inc. in the preparation of the RFI for the LMC property divided the tasks amongst soils and groundwater. The Soil RFI, completed in 1995, provided detailed information on the vertical and lateral extent of constituents in soil. A preliminary assessment was also conducted as part of the Soil RFI to determine if further investigation of the groundwater beneath the LMC property was needed. The Groundwater RFI was begun at the LMC property in late 1995 and was designed to acquire, analyze and interpret data to accomplish the following:

- Determine whether releases to soils have created a release to groundwater
- Collect groundwater data necessary to identify the type and concentration of hazardous waste and constituents released
- Evaluate the on-site extent of groundwater impacted by contaminant releases; and
- Evaluate the potential for downward migration of impacted groundwater from the first encountered groundwater to the underlying aquifers (G&M 1996b)

Exhibit 4 presents the wells and HydroPunch locations used in the Soil and Groundwater RFIs for the assessment of groundwater contamination. As part of the groundwater RFI, quarterly monitoring has been conducted since the initial sampling in late 1995.

Groundwater sampling results indicate that the quality of the shallow groundwater beneath the LMC property is relatively poor. The water is slightly saline and is very hard. The groundwater has also been impacted by TPH, VOC, SVOCs, dioxins and furans, and metals. TPH is of a major concern on the north western boundary. At this location recent sampling has indicated a high potential for free-product. TCE is the most frequently detected contaminant in groundwater and is detected at the highest concentrations along the southern half of the eastern property boundary. Other frequently detected VOCs in groundwater include 1,1-DCE, cis-1,2-DCE, 1,1,1-TCA, PCE, chloroform, benzene and toluene. Metals have also been detected in groundwater samples collected at the LMC property. Metals detected at concentrations exceeding primary Maximum Contaminant Levels (MCLs) include aluminum, arsenic, barium, chromium, cadmium, and nickel (G&M 1996a).

3.1 GROUNDWATER CONTAMINATION SOURCE

The sources of groundwater contamination migrating onto the Boeing property from the adjacent LMC property are well documented. These sources were identified in the Resource Conservation and Recovery Act (RCRA) Facility Investigation Report completed for LMC property by Geraghty & Miller in 1996 (G&M 1996a). The following is a discussion of the results of field and laboratory analyses of groundwater samples collected during the RCRA Facilities Investigation (RFI). Findings are divided into subsections addressing TPH, VOCs, SVOCs, dioxins and furans, metals, and hexavalent chromium. These findings have been supplement with the most recent quarterly groundwater monitoring results when available.

3.1.1 Total Petroleum Hydrocarbons

Thirty groundwater samples were analyzed for TPH content during the RFI. Of the 30 groundwater samples analyzed for TPH, TPH-d was the most frequently detected compound (13 of 30). The highest TPH concentrations, with the exception of detects in well P-2 (**Exhibit 5**), were located along the northern half of the eastern property boundary (G&M 1996a).

Quarterly groundwater monitoring conducted by LMC in July 1997 identified a sheen of petroleum product in the north-east corner of the LMC property.

Based on these findings and the close proximity to the Boeing property boundaries, this compound is believed to have migrated onto the north-west corner of the Boeing property.

3.1.2 Volatile Organic Compounds

Twenty nine groundwater samples were collected and submitted for volatile organic compound (VOC) analysis. Sixteen different VOCs were detected in these samples. TCE was the predominate VOC occurring in shallow groundwater detected in 27 of the 30 samples. TCE was found at a maximum concentration of 23,000 µg/L in well P-1 adjacent to the LMC-Boeing property boundary (G&M 1996a). A review of Boeing quarterly groundwater monitoring results shows a TCE concentration of 15,000 µg/L in DAC-P1 directly down gradient of the LMC well P-1 (K/J 1997). The primary MCL for TCE is 5 µg/L. Additional VOCs were identified in the RFI investigation, however not of this magnitude.

Based on these findings and the close proximity to the Boeing property boundaries, numerous VOCs are believed to have migrated onto the western portion of the Boeing property.

3.1.3 Semi-Volatile Organic Compounds

Sixteen groundwater samples were collected and submitted for semi-volatile organic compound (SVOCs) analysis. Five different SVOCs were detected in samples from three groundwater monitoring wells (P-1, P-5, and P-7). Each of these wells are located along the LMC-Boeing boundary. Pentachlorophenol was detected above its MCL (1 ug/L) (G&M 1996a).

Based on these findings and the close proximity to the Boeing property boundaries, SVOCs are believed to have migrated onto the western portion of the Boeing property.

3.1.4 Dioxin and Furans

Fifteen groundwater samples were collected and submitted for analyses for dioxin and furans (CDDs/CDFs). These samples included, 4 samples collected in January 1995 from monitoring wells P-1, P-2, P-3, and P-5; and 11 samples collected from monitoring wells P-1 through P-11 (duplicate in P-7) in March of 1995 (G&M 1996a).

Six different isomers of CDDs/CDFs were detected in the January 1995 groundwater samples collected from monitoring wells P-1, P-2, P-3 and P-5. The March samples were analyzed for only 2,3,7,8-tetrachlorodibenzodioxin (2,3,7,8-TCDD), the most toxic isomer. 2,3,7,8-TCDD was not detected in any groundwater samples from the site (G&M 1996a).

Based on these findings and the close proximity to the Boeing property boundaries, CDDs/CDFs are believed to have migrated onto the western portion of the Boeing property.

3.1.5 Total Metals

Groundwater samples were collected and submitted for analysis of 18 different total metals. These samples were collected from site monitoring wells P-1 through P-5 in January 1995 and from wells P-1 through P-10 (duplicate in P-7) in March 1995, and from 10 HydroPunch samples collected in February and March 1995.

Each of the 18 metals was detected in at least one groundwater sample from the site. Total metals concentrations detected in groundwater samples exceeded primary MCLs for six metals (MCLs in parentheses): aluminum (1.0 mg/L), arsenic (0.05 mg/L), barium (1.0 mg/L), total chromium (0.05 mg/L), cadmium (0.005 mg/L), and nickel (0.1 mg/L). Aluminum was detected in excess of the MCL in 13 of 15 sample locations. Along the property border, concentrations of total aluminum were highest in well P-5 at 67,200 µg/L. Arsenic exceeded MCLs in only 2 of the 14 locations sampled, and barium exceeded MCLs in only one location. Total chromium exceeded MCLs in 10 of 19 sample locations and was present above MCLs in border wells P-1 and P-5. Cadmium was detected above MCLs in the each of the two locations for which it was sampled, and nickel was detected above MCLs in 2 of the 5 locations for which it was sampled.

Based on these findings and the close proximity to the Boeing property boundaries, metals are believed to have migrated onto the western portion of the Boeing property.

3.1.6 Hexavalent Chromium

Hexavalent chromium (Cr^{+6}) is one of the most frequently detected metals in groundwater beneath the LMC property (**Exhibit 6**). Two potential sources of chromium contamination exist on the LMC property near wells P-1 and P-14. Well P-1 is located directly across the property boundary from the Boeing well DAC P-1. Well P-14 is located north of P-1 approximately 180 feet from the LMC/Boeing property boundary. Concentrations of Cr^{+6} measured in P-1 and P-14 in September 1996 were 1,100 µg/L and 1,590 µg/L, respectively. An extensive Cr^{+6} plume covers the eastern portion of the LMC property and is shown to clearly extend beyond the LMC property boundary. Plume concentrations at the eastern LMC boundary are in excess of 1,000 µg/L (G&M 1996b).

Based on these findings and the close proximity to the Boeing property boundaries, hexavalent chromium is believed to have migrated onto the western portion of the Boeing property.

3.2 DAC-P1 Monitoring Results Summary

Monitoring well DAC-P1 on the Boeing property was originally developed by LCM in an effort to confirm potential off-site migration. The well is located on the eastern boundary of the Boeing property, an area historically used by Boeing for an employee parking lot, and down gradient of LCM well P-1. Throughout the monitoring history of DAC-P1, contaminant concentrations have been closely correlated with constituents found in LCM's well P-1. This includes type and concentration of groundwater contaminants.

3.3 Proposed Monitoring Well Locations

The locations and depths of Boeing wells adjacent to the LMC property have been reviewed, in conjunction with the available data on localized hydrogeology, the potential source areas of groundwater contamination, and the estimated nature and extent of the contamination. A determination was made that additional wells are needed to supplement the existing wells. Prior to the installation of permanent monitoring wells, temporary test wells will used to delineate the horizontal extent of the two target contamination plumes.

The eleven proposed temporary test well locations are shown in **Exhibit 7**, and are labeled BP-01 through BP-11. Four vectors have been used in the design of the temporary monitoring well locations to minimize the number of wells necessary for the delineation of contaminates in the aquifer. Three of the vectors (A, B, and C) originate from DAC-P1, an existing Boeing monitoring well that shows high concentrations of chlorinated VOCs and potentially other contaminants migrating onto the Boeing property. The fourth vector (D) originates approximately 375 feet south of the north-west corner of the Boeing property boundary. This vector is down gradient of a known TPH source and will be used to identify the extent of the TPH plume.

Vector selection and geometry has been carefully orchestrated to provide basic information for the delineation of groundwater contamination. Vector B is in close correlation to the reported groundwater flow direction in the area. BP-01 and BP-02 will be located 150 and 450 feet from DAC-P1 along vector B, respectively. These wells will be used to evaluate the down gradient extent of contamination. BP-03 on vector B, located 1050 feet down gradient from DAC-P1, is a contingency well proposed only in the event that contamination is found in BP-02.

Vector A is due south and parallels the fence line between the LMC and Boeing properties. Wells BP-07, BP-08, and BP-09 will be placed 150, 450, 1050 feet from DAC-P1 along Vector A, respectively. The spatial distribution of these wells compliments the LMC wells P-6 and P-7. The data collected from these wells will be used in conjunction with the findings of LMC wells P-6 and P-7 to assess the southerly extent of contamination migrating onto the Boeing property.

Vector C is offset 235 degrees from Vector A in a north-easterly direction. BP-04 and BP-05 will be located 150 and 450 feet from DAC-P1 along vector C, respectively. These wells will be used to evaluate the northern lateral edge contamination identified in DAC-P1 and the down gradient TPH contamination from vector D. BP-06 on vector C, located 1050 feet cross-gradient from

DAC-P1, is a contingency well proposed only in the event that contamination is found in BP-05 or BP-11.

Vector D originates from approximately 375 feet south of the north-west corner of the Boeing property boundary. Vector D is offset 45 degrees from south in a south-easterly direction and is perpendicular to vector C. The predominate groundwater flow direction is reportedly to be south-east. BP-10 and BP-11 will be located 150 and 450 feet down gradient of the suspected TPH contamination, respectively. These wells in conjunction with BP-05 will determine the down gradient extent of TPH contamination.

Based on the findings of the proposed temporary wells, permanent monitoring well locations will be established and developed. The permanent wells will be developed to provide groundwater monitoring data necessary to meet all data quality objectives specified in Section 2. Temporary wells will be abandon by over-drilling to a depth of 12 feet and pressure grouting the remaining well casing.

3.4 Well Design and Installation

During the study, both temporary and permanent monitoring wells will be installed to measure water levels, determine the presence or absence of chemical compounds, and/or to determine the nature and concentration of contamination, if detected. All temporary wells will be completed and sampled prior to the strategic location of permanent wells for long-term monitoring. The following sections describe the procedures to be used during the drilling, installation, and surveying of these monitoring wells.

3.4.1 Monitoring Well Drilling and Installation

Drilling will proceed from ground surface to the first water bearing zone. Prior to drilling, the contractor will notify Underground Services Alliance (USA) and appropriate Boeing personnel to confirm the presence or absence of underground utilities near the boring locations. In addition, each borehole will be hand-augered to a minimum of five feet to clear the location for unmarked lines or utilities.

Drilling will be accomplished using 8 to 12 inch, outside diameter, hollow-stem augers, as described in **Exhibit 8**. All soil collected will be described in the field by the contractor's geologist, acting under the supervision of a California Registered Geologist. All field inspections and descriptions of soils will be completed on a Boeing soil boring log **(Exhibit 9)**. The boring log will include lithologic descriptions in accordance with the Unified Soil Classification System (USCS), identification number, sample interval, blow counts, and other pertinent data for each borehole drilled.

Upon completion of the boring, monitoring wells may be installed. The monitoring wells will be constructed using threaded, 2 (temporary wells) or 4-inch (permanent wells) diameter, Schedule 40, flush jointed, polyvinyl chloride (PVC) casing **(Exhibit 10)**. Groundwater monitoring wells will be constructed with a screened interval anticipated to extend a maximum of 15 feet into the saturated zone. The screened interval will most likely extend 10 feet above the saturated zone. The wells will be designed with provisions for sand pack and cement/bentonite casing seal above the screened interval to prevent infiltration of surface water. Slot size and sand filter pack will be based on location-specific grain size analysis. The casing and screen will be assembled above ground and lowered into the borings through the center of the hollow-stem augers to the proper depth. Grease, oil and glue will not be used when joining the sections together. Clean silica sand (compatible with the slot size) will then be added as the augers are retracted from the borings. Depth soundings will be taken regularly in order to insure that heaving conditions or sand bridging are not occurring, and the level of the introduced sand pack remains just above the lower extent of the augers being removed from the borehole. This process will continue until the sand pack extends 2 to 4 feet above the top of the slotted casing.

Following placement of the sand filter pack, the well will be surged using the appropriate diameter surge block. This will facilitate additional settling of the sand filter pack. Surging will consist of lowering the surge block to the bottom of the well and then raising and lowering the surge block along the entire length of the saturated screened interval. During surging operations, depth soundings will be taken regularly to determine whether additional sand will be necessary. Once surging is complete, bentonite pellets, chips, or slurry, depending on site conditions, will be added to the annular space above the sand pack. Potable water will be used to hydrate the bentonite. The amount of water added will be noted on the boring log. The bentonite seal will be 2 feet thick at a minimum. The remaining annular space will be grouted to approximately one foot below the surface with a bentonite and/or cement grout.

The PVC casing in each well will be capped with a PVC slip cap. The well heads will be protected by a traffic-rated, watertight box installed approximately one-inch above ground surface. A earthen pad, sloped to encourage surface-water runoff away from the monitoring well will be constructed around the well box. Each well will be affixed with a permanent identification marker.

3.4.2 Monitoring Well Development

Monitoring wells will be developed no sooner than 24 hours after the well installation has been completed. Groundwater levels and the total depth of the wells will be measured prior to and after completion of development. Groundwater will be removed from the monitoring wells using a stainless steel bailer or centrifugal pump, depending on the depth to water. Each well will be developed by removing a minimum of 3 well casing volumes of water or, in the event of a well screened in a low permeability zone, by bailing the well dry twice. If water is used during drilling, at least three times the volume of fluid injected into the formation during drilling shall be removed in addition to the standard three well casing volumes. Development water from each monitoring well installed during this study will be stored and sealed in DOT approved 55-gallon drums. All drums will be labeled appropriately and retained on site, pending analysis and subsequent treatment and/or disposal by the contractor.

Field measurements of pH. temperature, specific conductance and turbidity will be obtained at regular intervals throughout well development and will be recorded on a field data sheet. Best efforts will be made to develop the wells until groundwater becomes devoid of sediment, and pH and specific conductance measurements stabilize. These field parameters will be considered stabilized when two successive measurements of pH are within 0.5 units, temperature within 0.5 degree Celsius (C), specific conductance is within 10 percent, and turbidity is $\leq$ 50 Nephalometric Turbidity Units (NTU). The pH, temperature-specific conductance, and turbidity meters will be calibrated and operated in accordance with **Exhibits 11 through 13**, respectively.

3.4.3 Survey

Newly installed temporary and permanent wells will be surveyed for location and elevation. A permanent mark on the PVC casing will be used as the reference point for water-level measurements. Surveyor reference marks will be located on both the well casing and outer protective casing. The northing/easting coordinates of the sample location will be surveyed by a licensed surveyor to within ± 1.0 foot. Elevations will be surveyed to an accuracy of ± 0.01 foot. The elevation of each well will be surveyed relative to mean sea level. The reference points will be measured by a California-licensed surveyor. Survey information will be documented on survey forms, the master surveyed site plan and in a computer database format.

4. Sampling & Analysis Plan

This section describes the types of field measurements that will be made and presents the procedures to be followed by personnel performing field measurements and collecting groundwater samples. Quality assurance/quality control procedures, sample handling and custody requirements, laboratory custody procedures, and documentation requirements are also presented in this section.

4.1 Field Analysis and Measurements

Field data will be collected during well installation and sampling activities. The types of field data to be collected at the site include:

- Water-level measurements
- Conductivity, temperature, and pH measurements
- HNu photoionization detection

The following methods presented below are intended to ensure that field measurements are consistent and reproducible when performed by various individuals. Field personnel will record field measurements on standardized Daily Field Measurement Record as described in section 4.5.2. In addition to properly recording data on the standardized forms, personnel will maintain field notebooks in which all data will be recorded.

4.1.1 Water Level Measurements

Water levels may be measured using a steel tape, electric probe, and/or pressure transducer. If a pump or other equipment is in the well, measurement devices will be lowered slowly to avoid entanglements. Water level measurements in completed wells will be made from a permanently marked reference point on the well casing. The elevation of this point will be established by survey in relation to a National Geodetic Vertical Datum (NGVD). Water levels measured in boreholes or wells during construction will be made relative to the ground surface. Measurements will be made and recorded in the Daily Field Measurement Record to the nearest hundredth of a foot. In general, water level measurements to determine hydraulic gradients, and in some permeability or aquifer tests, will be made with an electric probe or transducer.

4.1.2 Conductivity, Temperature, and pH Measurements

Specific conductance, water temperature, and pH measurements will be made in the field during purging, before and after each water sample collection, and during pumping tests. The water sample will be placed in a sample container solely for field testing. A field pH meter with a combination electrode or equivalent will be used for pH measurements. Temperature measurements will be performed using standard thermometers or equivalent temperature meters. Combination instruments capable of measuring two or all three parameters may also be used.

All instruments will be calibrated as described in the instrument manual. If conductivity standards or pH buffers are used in field calibration, their values will be recorded on the Daily Field Measurement Record. All probes will be thoroughly cleaned and rinsed with distilled water prior to conducting any measurements.

4.1.3 HNu Photoionization Detector

The HNu photoionization detector will be used for measuring gaseous levels of a variety of organic and inorganic compounds. The HNu is a portable, nonspecific, vapor/gas detector which will be calibrated using isobutylene. Isobutylene provides a mid-range response for most contaminants of interest, is relatively safe to use, and is readily available from the supplier. The HNu contains an ultraviolet light source within its sensor chamber. Ambient air is drawn into the chamber. If the ionization potential of any molecule present in the ambient air is equal to or lower than the energy of the ultraviolet light source, ionization will take place, causing a deflection in the meter. The HNu will be used to monitor soil cuttings during drilling operations. Cutting samples will be measured by holding the tip of the probe at the surface of the sample for 5 seconds. Response time is approximately 90 percent at 3 seconds. The measurements are reported in parts per million. The HNu will also be used to measure organic vapors in the headspace of monitoring wells after the cap has been removed and prior to sampling. All readings will be recorded in the Daily Field Measurement Record.

4.2 Groundwater Sampling

Groundwater samples will be collected from each of the wells installed as part of the groundwater investigation and submitted to the laboratory for analysis. The sample data returned from the laboratory will be used to determine the nature and extent of the contaminants in groundwater migrating from the LMC property. Groundwater samples will be shipped to a State certified laboratory for analysis. Samples collected from wells BP-01 through BP-09 will be analyzed for:

- VOCs using EPA Method 8260
- Title 22 Metals
- Hexavalent Chromium using EPA Method 6010

Samples collected from wells BP-10 and BP-11 will be analyzed for:

- TPH using EPA Method 8020 and modified EPA Method 8015
- VOCs using EPA Method 8260

The procedures for purging the monitoring wells prior to sampling and for collecting groundwater samples are as follows:

1. Remove the well cap and check for volatile organics in the headspace using an organic vapor monitor (OVM). Record the reading in the Daily Field Measurement Record.
2. Measure the static water level and total depth of all wells as described in section 4.1.1 prior to collecting groundwater samples. If more than 24 hours have elapsed since water levels were collected, recheck the static water level prior to purging for documentation purposes. Record the data and determine the purge volume using the following equation

$$V = C_f \pi r^2 h$$

where:

V	=	well volume (gallons)
r	=	well radius (ft)
h	=	column of water in the well (total depth - depth to water) (ft)
C_f	=	7.48 gallons/ft^3

3. Purge water from the well until conditions described in item 4 below have been met. Water may be removed from the well using a bailer, submersible pump, surficial suction pump, or bladder pump. Criteria for selecting the proper device for purging the well are presented below. The use of a pump is the preferred evacuation method; bailers will only be used if it is not possible to use a pump.

   a. Bailers are most applicable for sampling after purging and for purging small diameter, low yield wells. If a bailer is used, it should be dedicated to the well, i.e., used only for that well. Field decontamination of bailers is not permissible.

   b. Submersible pumps are most effective for wells that recharge quickly and where water levels are greater than 20 feet bgs. When a submersible pump is used, the pump will be slowly lowered into the well on a polypropylene safety line. Once the pump has been lowered to the desired level, the safety line will be secured. The submersible pump must be decontaminated between wells by washing the outside surfaces with tap water and a non-phosphate detergent, rinsing it with tap water, placing the pump in a container and pumping 20 gallons of potable water through it, and then rinsing again with distilled/deionized water. New drinking water grade polyethylene tubing will be used at each well where the submersible pump is employed for purging.

   c. The surficial suction pump can only be used if the water level in the well is not lower than 20 to 22 feet bgs. Dedicated intake tubing should be used for each well. New linear polyethylene tubing that conforms to the ASTM drinking water grade specifications will be used as the intake line. The intake line is discarded after every use.

   d. The bladder pump typically will purge the well at a rate of 1 to 2 gallons per minute. The pump can be used for any size well if the volume of water in the well will not require an excessively long pumping time. New drinking water grade polyethylene tubing should be used as the discharge line. The pump will be dismantled and decontaminated prior to each use.

4. Measure the pH, conductivity, and temperature after each well volume has been purged to determine stabilization. Purging will be completed when five well volumes have been removed or when two successive measurements of specific conductance, pH, and temperature give values within the following ranges:

   a. Specific Conductance: $\pm$ 10 µmhos/cm for 0-800 range (+ 50 at 800-1000)

   b. pH: $\pm$ 0.1 pH units

   c. Temperature: $\pm$ 0.5°C

5. Record the stabilization results on the Daily Field Measurement Record. Wells that recover very slowly should be purged at a rate of less than one gallon per minute. If the

well is purged to near dryness using this slow rate, allow it to recover before collecting a sample.

6. Collect a groundwater sample from the well within two hours of purging. Slow recharging wells are permitted to sit for no more than 12 hours prior to sampling.

   a. Unfiltered groundwater samples can be collected directly from the pump discharge line. Samples may also be collected by using decontaminated, disposable, bottom-loading Teflon or polyethylene bailer. Clean polypropylene rope will be used to lower the bailer into the well. The field team will wear disposable gloves when handling the sampling equipment. New rope and disposable gloves will be used at each well. Care will be taken to ensure that bailers or rope do not come into contact with any contaminated surface.

   b. Filtered groundwater samples can be collected by placing an in-line filter in the pump discharge line prior to sample collection.

   c. Samples will be carefully transferred into containers, avoiding agitation or turbulence, which can result in the loss of VOCs and/or excessive oxygenation of the samples. Care will be exercised to avoid breakage and to prevent contact of any foreign substance with the interior surface of the containers or caps. Caps will not be removed from the container until sampling actually occurs.

   d. A sample label will be affixed to each sample container indicating the well number, and sample collection date. This information will be entered into the Daily Analytical Sample Record as described in section 4.5.3.

   c. Samples will be packed on blue ice in a cooler and the Analytical Sample Record and chain-of-custody form will be completely filled out. Samples will be shipped to the laboratory at the end of each day's sampling.

7. All nondisposable sampling equipment will be decontaminated. Decontamination of equipment will prevent or minimize cross-contamination, or the transfer of contamination from the equipment to the sample. This is important for preventing the introduction of error into sampling results and for protecting the health and safety of site personnel. Equipment will be cleaned before and after each use with Alconox in water followed by a double rinse in distilled water. Decontamination fluids collected during equipment cleaning will be stored in properly labeled 55-gallon drums and disposed of in accordance with applicable regulatory requirements

4.3 Quality Assurance

Standard laboratory quality assurance/quality control procedures developed by the Department of Toxic Substances Control and the Regional Water Quality Control Board will be followed to insure the quality of the analytical results obtained from all samples. In addition, three types of quality control samples; trip blanks, equipment blanks, and rinsate blanks will be collected.

4.3.1 Trip Blanks

A trip blank is used to indicate potential contamination due to migration of VOCs from the air on the site or in sample shipping containers into the sample. At least one trip blank will be prepared for each cooler used for storage and transport of samples. Trip blanks will be submitted to the laboratory for VOC analysis by EPA Method 8260. The trip blank will consist of a vial of laboratory supplied distilled, deionized water. The trip blank will accompany the empty sample containers to the field and will be placed in the cooler to be returned to the laboratory with the samples collected on that sampling day. A trip blank will not be opened until it is analyzed in the laboratory with the actual site samples.

4.3.2 Equipment Blanks

An equipment blank is used to determine if sampling equipment is cross-contaminating field samples. The equipment blank is obtained by collecting laboratory supplied distilled, deionized water as it is poured through or over pieces of sampling equipment. Each sampling crew will collect one equipment blank for every 20 groundwater samples. Equipment blanks will accompany the samples collected on that day to the laboratory for analysis. The equipment blank(s) will be analyzed for:

- TPH by EPA Method 8020 and modified EPA Method 8015
- VOCs by EPA Method 8260
- Title 22 Metals
- Hexavalent Chromium by EPA Method 6010

4.3.3 Rinsate Blanks

A rinsate blank is used to evaluate the effectiveness of field decontamination procedures. The rinsate sample is obtained by collecting laboratory supplied distilled, deionized water as it is poured through or over decontaminated sampling equipment. Each sampling crew will collect one rinsate blank for every 20 groundwater samples. Rinsate blanks will accompany the samples collected on that day to be laboratory for analysis. The rinsate blank(s) will be analyzed for:

- TPH by EPA Method 8020 and modified EPA Method 8015
- VOCs by EPA Method 8260
- Title 22 Metals
- Hexavalent Chromium by EPA Method 6010

4.4 Sample Handling and Custody

To establish the documentation required to trace sample possession from the time of collection to the time of sample analysis and reporting, a chain-of-custody (COC) form will be used. The completed COC form will accompany every sample to the designated State-certified laboratory and also through the laboratory during sample analysis. The following information shall be completed on the chain-of-custody form:

- Project number
- Total samples shipped
- Date samples are relinquished
- Signature of sample collector
- Sample identification
- Date/time samples collected
- Sample type
- Container type
- Analyses requested
- Signature of person or persons involved in the chain of possession

4.4.1 Field Custody Procedures

The following chain-of-custody procedures will be implemented to maintain and document sample possession:

1. Samples will be collected as described in this workplan.

2. The Task Leader is personally responsible for the care and custody of the samples until they are properly transferred or dispatched to the analytical laboratory.

3. Labels will be completed for each sample and then affixed to the sample container as described in section 4.2, item 7d.

4. If a sample label should become lost during shipment, a written statement shall be prepared detailing how the sample was collected and transferred to the laboratory. The statement should include all pertinent information, such as entries in field log books regarding the sample, whether the sample was in the sample collector's physical possession or in a locked compartment until hand-transported to the laboratory, etc.

4.4.2 Transfer of Custody and Shipment

The following procedures will be implemented when transferring custody of samples:

1. Samples will be accompanied by a chain-of-custody form. When transferring possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the form. This form documents sample custody and transfers from the sampler, often through another person, to the analyst in the laboratory.

2. Samples will be packaged properly for shipment and dispatched to the laboratory for analysis, with a separate custody form accompanying each shipment (i.e., one for the samples retained in the field, one for samples shipped to the laboratory). Containers will be sealed for shipment to the laboratory.

3. Each shipment will be accompanied by the chain-of-custody form that identifies the contents of that shipment. The courier transporting the shipment will sign the chain-of-custody form. The original form will accompany the shipment and a copy will be retained by the Field Operations Leader for inclusion in project reports.

4. If sent by common courier or air freight, proper documentation will be maintained (i.e., FedEx airbill).

4.4.3 Laboratory Custody Procedures

The following procedures will be implemented when the samples arrive at the laboratory:

1. A designated custodian will take custody of all samples upon their arrival at the laboratory. When samples are delivered to the laboratory after hours or when the sample custodian is not present to accept the samples, the samples will be placed in a designated sample area in accordance with the procedures established by the laboratory.

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2. The custodian will be responsible for inspecting all sample labels and chain-of-custody forms to ensure that the information on each corresponds and that all are completed properly. The custodian will then assign a unique laboratory number to each sample and then transfer the samples to secured storage areas. The custodian will enter the label data into the sample tracking system of the laboratory. This system will use the sample label and will ensure that all samples are transferred to the proper analyst or stored in the appropriate secure area.

4.5 Documentation and Photography

Each environmental crew leader is required to maintain daily activity logs on-site during field activities to provide a daily record of significant events, observations, and field operations. The crew leader will submit the daily activity log to management for review by 8:00 a.m. the following day. All entries on the daily activity log and the field data sheets will be made legibly in indelible ink, signed, and dated. The field entries will be factual, detailed, and objective. The daily activity log will consist of:

1. A Field report
2. A Daily Field Measurement Record
3. A Daily Analytical Sample Record
4. A Daily Summary of Field Activities

A description of each component of the daily activity log is presented below.

4.5.1 Field Report

The field report is used to document activities occurring at the site. It also updates management and other team members who may not be on the site on a daily basis on activities that are occurring at the site. The information contained in the field report will include, but is not limited to, the following:

- Date,
- Project name and number,
- Location,
- Weather conditions at the site,

- Names of environmental crew members present on-site and names of other organizations present on-site (such as construction crews),
- Detailed chronological record of activities at the site, and
- Name and signature of the individual completing the field report.

In the detailed chronological record of activities it is important to record activities at the site on an hourly basis, at a minimum. It is also important to record equipment calibration data and information about any activities, extraneous to sampling activities, that may affect the integrity of the samples collected on that day (e.g., emissions from nearby operations).

4.5.2 Daily Field Measurement Record

The Daily Field Measurement Record will be used to record field measurements collected during sampling. The information contained in the record will consist of, but is not limited to, the following:

- Project name and number,
- Date,
- Well being for which data is being measured,
- Time sample was collected,
- Water level, conductivity, temperature, pH, and sample headspace reading

4.5.3 Daily Analytical Sample Record

The daily analytical sample record is intended to log groundwater samples collected at the site on a daily basis. The information included on the daily analytical sample record will include, but is not limited to, the following:

- Project name and number,
- Date,
- Well being sampled,
- Time sample was collected,

- Sample number assigned to the sample,
- Comments about the sample.

4.5.4 Daily Summary of Field Activities

The daily summary of field activities is intended to present concise summary of installation and sampling activities that occurred at the site on that day. In addition, the daily summary of field activities will include:

- Date,
- Project name and number,
- Location,
- Names of contracting and environmental companies present on-site that day,
- Listing of any site visitors on that day, and
- Name and signature of the individual completing the field report.

In addition to the written documentation described above, representative photographs will also be taken of the well installation and sampling procedures. Photographs will logged by location.

4.5.5 Corrections to Documentation

If an error is made on any of the daily activity log entries, the individual who signed the document will make corrections by crossing out the error with a single line and then entering the correct information. The erroneous information should not be obliterated. All corrections will be initialed and dated.

4.5.6 Disposition of Documentation

Upon completion of the field effort at the facility, field documentation will be clearly labeled and placed in the project files of both Boeing and LMC.

4.5.7 Laboratory Files

Laboratory files will be maintained for the groundwater monitoring. The file will contain all data and reports including raw data calculation sheets, chromatograms, and mass spectrums in both electronic and hard copy formats. All written and electronic records of laboratory handling and analysis will also be maintained as part of the permanent file.

5. REPORTING AND SCHEDULE

The anticipated task/reporting schedule for well installation and the initial sampling is presented in table X below.

TABLE X.
TASK AND REPORTING SCHEDULE

DATE	TASKS/REPORTS
August 20, 1977	Workplan preparation and delivered to agency for review and approval.
September 1, 1997	Temporary monitoring well installation begins.
September 10, 1997	Groundwater sampling of temporary wells.
October 10, 1997	Groundwater monitoring report preparation and agency review.
October 30, 1997	Install permanent wells.
November 10, 1997	Collect first round of permanent well samples.
December 10, 1997	Permanent well sampling report to agency for review.

Groundwater samples collected after the November 10 sampling round will be performed on a quarterly basis. This workplan does not cover sampling conducted after the first permanent well samples. Quarterly groundwater water sampling will be covered under a separate workplan.

FACSIMILE TRANSMITTAL

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TO: Mike Kroetz

FROM: Tom Overturf

DATE: August 18, 1997

COMPANY: Fremont Associates

FAX # 310-516-8222 **Phone #:** 310-516-1615
No. of Pages Including Transmittal: 2
Hard Copy Mailed: Yes____ **No** X

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Thank you

If copy received incomplete or illegible
please call and ask for
Kim Nichols (562) 627-3075

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FROM: Tom Overturf

DATE: August 18, 1997

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No. of Pages Including Transmittal: 2

Hard Copy Mailed: Yes____ No X

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Thank you

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